Dried blood spot HIV-1 RNA quantification using open real-time systems in South Africa and Burkina Faso

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Abstract:

There is an urgent need to assess the accuracy/feasibility of using dried blood spots (DBS) for monitoring of HIV-1 viral load in resource-limited settings. A total of 892 DBS from HIV-1-positive pregnant women and their neonates enrolled in the Kesho Bora prevention of mother-to-child transmission trial conducted in Durban (South Africa) and Bobo-Dioulasso (Burkina Faso) between May 2005 and July 2008 were tested for HIV-1 RNA. The combination Nuclisens extraction method (BioMérieux)/Generic HIV Viral Load assay (Biocentric) was performed using one DBS (in Durban) versus 2 DBS (in Bobo-Dioulasso) on 2 distinct open real-time polymerase chain reaction instruments. DBS HIV-1 RNA results were compared with plasma HIV-1 RNA and HIV serology results used as the gold standards. The limits of detection of assays on DBS were 3100 and 1550 copies per milliliter in Durban and Bobo-Dioulasso, respectively. DBS HIV-1 RNA values correlated significantly with plasma levels (n = 327; R = 0.7351) and were uniformly distributed according to duration of DBS storage at -20°C (median duration, 280 days). For early infant diagnosis, the sensitivity and specificity were 100% (95% confidence interval: 97.2 to 100.0 and 96.5 to 100.0, respectively). HIV-1 viral load kinetics in DNase-pretreated DBS were similar to those obtained in plasma specimens among 13 patients receiving antiretroviral treatment. HIV-1 RNA findings from serial infant DBS collected prospectively (n = 164) showed 100% concordance with HIV serology at 18 months of life. Our findings strongly advocate the implementation of DBS HIV-1 RNA testing in remote areas from low-income and middle-income countries.